Novel pattern in software architecture based on stored procedure

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Abstract

Nowadays, introducing of various software architectures have caused the development of software the world over. Obviously, the advantages and disadvantages of each develop architecture determines the popularity and implementation level of that. In this research, a stored procedure called SP-based architecture is introduced to literature. This pattern reduces the large number of the programming lines indeed. Moreover, it can be adapted on most programming areas. Therefore, it is an almost entirely beneficial tool for data scientists and those who are engaged with data processing. Furthermore, it can be used as platform for conducting complex affairs of internet of thing (IOT) applications.

Introduction and Literature Review-I

Software architecture offers a total vision of software systems with dropping low level of complexity implementation [1]. Software architecture is basic phase in system development life cycle (SDLC), just like building basic structure determines final shape and development [2]. The software systems developers select an appropriate software architectural model for the implementation of the system based on business requirements. Change of this choice could be very costly in the future. This selection has led to a wide range of effects in different phases of development and maintenance of software systems. Furthermore, according to the choice of each architecture, developers will face various advantages and disadvantages.

Meanwhile, the proposed architecture of this paper attempts to introduce a flexible structure consisted with most businesses and conditions. It provides the greatest advantage with the least disadvantages. This Architecture very good operates in most area like Data mining, big data and data Science applications. Since the proposed structure operates based on stored procedure, the processing performance is raised considerably. Therefore, It is an effective and fast in tool for processing large data.

This architecture created during an implementation of a project that its business logic was in the stored procedures. This architecture has been further developed by using layered architecture, micro-service, microcontroller and event -driven architecture. This architecture is implemented with relational banks and various languages like Oracle, Sql Server and mySql, and the Node js, .net and php framework.

Famous and Developed Architectures -II

Totality, there are four main architectures known as follows.
- Layer architecture
- Event-driven architecture
- Microkernel architecture
- Microservice architecture

Proposed architecture of this research takes benefit of mentioned popular basic models and presents a practical environment. This integrated structure is called stored procedure architecture.

Stored procedure suggests hybrid architecture so similar to event-oriented architecture. So events are defined on html elements that are received from the server in ajax. The type of event to be executed is defined through the various attributes within the element such as data-runsp, data-del and etc for identify of stored procedure and for related data, and the data-in attribute is used. As a result, CRUD operations are defined based on these attributes.

These operations are processed in three stages. The first stage of pre-processing in the client part determines the parameters associated with the operation. The second step is to process the event on the server and execute the related process routine. Finally, the third step is post-processing in the client, which reflects the result of the server in the browser.

This architecture inherits from the layered architecture, the different segments of coding in three layers. However, the final view is created in html format through the stored procedure.

On the other hand, the proposed architecture inherits from the microkernel architecture, the plug-in and development around a central kernel. But, there is far little dependency between the core and the plug-ins in the form of stored procedures. And during the run time, new operations can be added to the system.

The heritage of MicroService architecture to this architecture is the implementation of Run the chain of stored procedure. But unlike MicroService architecture, the standard for connecting and coding the services is defined and specified in the stored procedure. Besides, the control of the access level through the core is dynamically controlled. Moreover, this architecture of event-oriented architecture inherits the creating queues for events and managing requests.

Implementation of proposed model -III

This architecture can be implemented with different languages and databases. On the client and server side, there are generic functions written to run and process the request. These functions prevent the progressive growth of the source code. In this architecture, requests are executed in 5 steps.

First Step: The first stage of the preprocessing function is executed with the occurrence of an event by the user. This function is called to collect the values of the input elements, announce the deletion, fetch the item id, and so on. The preprocessing functions are defined by the on method in jQuery.

Second Step: in this step, the request function is called by the preprocessor functions. In the second step, the executor function is called by the preprocessing functions. For this purpose, the operation identifier is sent along with the handler's address data on the web server.

Third Step: The third step is validation of the request on the web server. After the request arrives to the web server, the requested operation is initially identified. If its execution is limited, it should be validate. This is done only by a simple query. The user ID and the requested operations are in a simple SQL query to check the access. If the result of this query was zero, execution of the operation would be stopped. Otherwise, the operation is performed in the next step.

Fourth Step: The fourth step is the execution of the operation in the form of stored procedures. For this purpose, the connection and stored procedure parameters are created dynamically. Then, the values received from the client are set to input parameters. Now, the stored procedure is ready for execution with definitions and setup. After execution, the stored procedure output is sent to the client.

Fifth Step: The fifth step is processing server output and reflection in the browser. Outputs received from the server are divided into 2 categories:
- The first category is encoded: to display the error message, success, and etc
- The second category is html code which is created directly by stored procedures and these codes are placed in the defined container. The user can interact with that content for future actions.

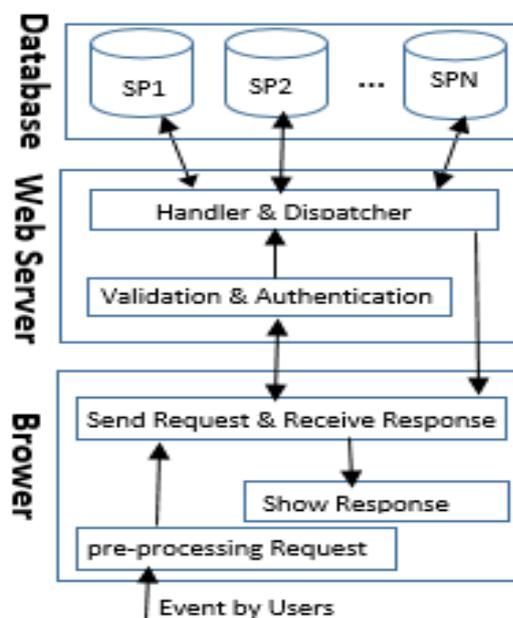The following figure shows the steps to execute a request from beginning to end.

Figure 1 SP-Based architecture

Model Evaluation-IV

In this section, we will analyze the .Net Core object-oriented architecture and the architecture of the stored procedures. An analysis of software architecture is done by a series of parameters. These parameters assess the quality of the selected architecture and determine its usefulness for the stakeholders [5]. In the selected method, key parameters, such as coding volume, development speed, etc., are carefully evaluated. Object-oriented programming was designed to facilitate the implementation of complex and large systems with the principle of division and conquest. The basic drawback of this high-level conflict approach is to detail the implementation of individual classes, methods, and objects. In addition, a bunch of codes should be created by the programmer to implement, call, and work with the object-oriented model, which has nothing to do with the implementation of business logic. But in a SP-based architecture, the programmer is not involved with objects and details of their implementation, and only focuses on transaction implementation. The approach of this architecture is transaction-centric. As a result, transaction IDs and data associated with an automated transaction mechanism are executed. Transactions in this template are well controlled. Successful and unsuccessful execution is accurately recorded and reported. In this architecture, codes have the least

dependency. Operations are encapsulated in stored procedures. Therefore, following advantages are achieved.

- the speed of detection and resolution of errors increases
- the network traffic decreases
- transactions perform faster
- the access control become more accurate and easier to check

The evaluation of the system is limited to about 300 modules and has 1,600 operations. Two approaches to object-oriented .Net Core and the architecture of stored procedures are compared. The following results are achieved due to the approach of placing business logic in stored procedures.

Table 1 Results of an implementation of SP-Based architecture

Title	Explanation	Reduction rate
Number of files	Being a business logic in Database Stored Procedure	98%
Line of code	no need to define actions, models and coding in different layers, as the project volume increases, the number of files remains constant	88%
Number of repeated	No repeat codes in different categories	100%
Execution Costs	low programming with basic language (SQL, html, etc)	82%

Other advantages of this architecture are as follows.
- sharp decrease in coding, the number of project files and coding in basic languages like SQL, html, etc
- greatly cost reduction of implementing the project
- accurate logging of all successful and unsuccessful transactions with associated parameters
- easily publish and backup copies of the project.

Conclusion-V

This research developed an architecture SP-based Architecture which work based on procedures stored in different domains is effective and useful. It is a useful environment for programming in different practical areas like ERP, data mining and data mining systems. Two main features of this architecture make it useful for mass data. First, the encapsulation of executing operations in the form of stored procedures and database functions, which greatly increases the speed of execution of operations. And the second is a light controller layer that allows very wide interaction with a large range of different devices. These are also supported by a experiment.

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